

not plant predators (p. 187)—butterflies typically remove small fractions of their hostplant biomass and do not kill them. It is doubtful that *Heliconius* adults sequester alkaloids from coevolved larval feeding on *Passiflora* (p. 190)—their distasteful properties are derived from the ability to feed on pollen as adults.

The value of over 350 references to diverse and important research papers in the bibliography will not be lost on students of butterflies. However, including other references besides Gilbert and Shapiro from Vane-Wright, R. I. & P. Ackery's, (eds.), 1984, *The Biology of Butterflies*, Symp. Roy. Ent. Soc. 11, and crediting authors of primary research (not just the review author), would further increase the book's utility as a research sourcebook. We feel a citation to certain facts alluded to by Douglas would have been appropriate and led us to the reference (e.g., Flight muscle mechanism and wing articulation, p. 49; 100 hostplants for the painted lady, p. 115; mites reported to weaken butterflies, p. 137; shared flavinoids between Polygonaceae and Rosaceae, p. 179).

In summary, this is a valuable introduction to the field of butterfly biology, and ranks as one of the first contemporary presentations of the wide range of biological investigation on the butterflies. As such, it must not be expected to be the balanced, comprehensive presentation of the field, as was Ford's *Butterflies* in its day. We eagerly anticipate future contributions to the genre which integrate natural history, systematics, and the evolutionary ecology of butterflies from all regions. *The Lives of Butterflies* would be an appropriate companion to such works.—P. J. DeVries and R. Dudley, *Smithsonian Tropical Research Inst., Box 2072, Balboa, Panama*.

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**A Scanning Electron Microscope Atlas of the Honey Bee.**—E. H. Erickson, Jr., S. D. Carlson, and M. B. Garment. 1986. Iowa State University Press, Ames, Iowa. 292 pp. \$51.95.

Poring over an atlas, whether geographical or anatomical, should stimulate the imagination and the sense of adventure. Large pages, multiple illustrations of unknown territories, an abundance of factual detail and varying textures—this is the stuff that feeds the urge to explore. I am pleased to report that this book is a success in these respects. The hundreds of micrographs and photomontages illustrating the surface structures of worker, queen, and drone honey bees, carefully chosen and tastefully arranged on expansive 9 × 12 pages, are at once a dazzling display of present knowledge and an invitation to plunge into the many morphological mysteries that remain unresolved. For although we have more knowledge of the biology—behavior, physiology, morphology—of the honey bee than of any other insect (and indeed almost any other animal species), the figure captions crackle with phrases such as “function unknown,” “maybe,” and “seems to be.” The call to further exploration is clear.

Unfortunately, the high technical and esthetic standards met by the micrographs were not uniformly applied to the rest of this book. The line drawings of the Appendix, although helpful and adequate, are sadly lacking in the beauty and charm of R. E. Snodgrass' classic illustrations in *The Anatomy of the Honey Bee*. The fairly short

text passages contain several errors. A few examples: the annual monetary values of the U.S. beekeeping industry and of bee-pollinated agricultural crops in the U.S. are misstated (appropriate estimates would be about \$100 million and \$10–20 billion, respectively); beeswax does not serve a useful function in the production of honey beer; and there is no evidence that feral honey bee swarms choosing home sites prefer living trees to dead ones. Especially disappointing is the inclusion in the text of such statements as “the drone’s sole purpose for being is mating” and “[the queen’s] only complex behavior seems to be that of seeking out and killing sister queens and mating”; these canards, which occur frequently in the popular biological literature, are expressions of poor biological thinking. A final criticism is that many of the statistics are given without regard for the appropriate number of significant digits. Thus, for instance, in the presentation of the fascinating fact that after 500 miles of accumulated distance flown the body of a worker honey bee physically breaks down, the figure is converted to the impossibly precise 804 km.

However, to return to the bright side, this book does have an extensive glossary, the index has been well put together, and the plate layouts have style and grace. This atlas should excite students and researchers about the possibilities of further investigating honey bee biology and, indeed, all aspects of invertebrate morphology.—*Richard Nowogrodzki, Department of Entomology, Cornell University, Ithaca, New York 14853.*

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**The Behavioural Ecology of Ants.**—John H. Sudd and Nigel R. Franks. 1987. Chapman & Hall and Methuen, New York. x + 206 pp. Price: \$55.00 cloth; \$23.00 paper.

There are approximately 1,200 living species of ants, and the variation and complexity of their social organization is unique in the animal world. Ant colonies are characterized as *eusocial*, because they have overlapping adult generations, cooperative brood care, and sterile worker castes. According to the authors, this small volume primarily concerns two related issues: (1) how eusociality has evolved under the influence of natural selection; and (2) why it is found only in termites, ants, and some species of bees and wasps. Although, the authors succeed in their mission, it is somewhat misleading. For in addition to providing a theoretical discussion on the evolution of social behavior in insects, the book provides an excellent up-date on the behavior and ecology of a wide variety of ant species.

After an introductory chapter on kin selection and its influence on the number of queens in ant colonies, the authors provide a brief review (Chapter 2) of ant phylogeny. This is not so much a systematic treatment as it is a discussion of the major ecological and behavioral differences among the approximately 12 ant subfamilies.

Chapters 3 and 4 are a bit more esoteric, dealing with “economics” and caste structure. The former topic considers issues such as the time-course of colony growth and reproduction, while the latter focuses on division of labor among individuals differing in morphology or age. Age-related jobs are called temporal polyethism, the best example being that young individuals typically stay in the nest and tend the brood, while foragers are almost always the oldest workers.